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IMPLEMENTATION COMPLETION AND RESULTS REPORT  
(IDA-47980)

ON A

CREDIT

IN THE AMOUNT OF SDR 101.50 MILLION  
(US\$150.0 MILLION EQUIVALENT)

TO THE

UNITED REPUBLIC OF TANZANIA

FOR A

TANZANIA - BACKBONE TRANSMISSION INVESTMENT PROJECT

December 21, 2017

## CURRENCY EQUIVALENTS

(Exchange Rate Effective November 30, 2017)

Currency Unit = Tanzania Shilling (TZS)  
TZS 2,241.00 = US\$1  
US\$1.42 = SDR 1

## FISCAL YEAR

July 1 – June 30 (Government of Tanzania)

## ABBREVIATIONS AND ACRONYMS

AfDB	African Development Bank
CAS	Country Assistance Strategy
CPF	Country Partnership Framework
EAPP	East African Power Pool
EDCF	Economic Development Cooperation Fund (South Korea)
EIB	European Investment Bank
ENPV	Economic Net Present Value
EPP	Emergency Power Producers
ERR	Economic Rate of Return
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
FOCL	Fiber Optic Communication Line
GDP	Gross Domestic Product
GoT	Government of Tanzania
HFO	Heavy Fuel Oil
HVAC	High Voltage – Alternating Current
HFO	Heavy Fuel Oil
ICR	Implementation Completion and Results Report

IDA	International Development Association
IRR	Internal Rate of Return
ISR	Implementation Status and Results Report
JICA	Japan International Cooperation Agency
M&E	Monitoring and Evaluation
NEP	National Energy Policy
NPV	Net Present Value
NSGRP	National Strategy of Growth and Reduction of Poverty
OHL	Overhead Line
OISF	Owners Implementation Support Firm
PAP	Project-Affected People
PDO	Project Development Objectives
PIU	Project Implementing Unit
PPP	Public Private Partnership
PSMP	Power System Master Plan
RAP	Resettlement Action Plan
SAPP	Southern African Power Pool
SWS	Shield Wire System
TANESCO	Tanzania Electric Supply Company Limited
TEDAP	Tanzania Energy Development and Access Expansion Project

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# UNITED REPUBLIC OF TANZANIA - BACKBONE TRANSMISSION INVESTMENT PROJECT

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<b>A. Basic Information</b>				
Country:	Tanzania	Project Name:	Tanzania - Backbone Transmission Investment Project (BTIP)	
Project ID:	P111598	L/C/TF Number(s):	IDA-47980	
ICR Date:	11/15/2017	ICR Type:	Core ICR	
Lending Instrument:	Specific Investment Loan	Borrower:	Government of Tanzania	
Original Total Commitment:	SDR 101.50 million	Disbursed Amount:	SDR 40.61 million	
Revised Amount:	SDR 40.61 million			
<b>Environmental Category:</b> A (Full Assessment)				
<b>Implementing Agencies:</b> Tanzania Electric Supply Company (TANESCO)				
<b>Co-financiers and Other External Partners:</b>				
European Investment Bank (EIB): US\$134.50 million				
African Development Bank (AfDB) US\$64.855 million				
Japan International Cooperation Agency (JICA): US\$64.855 million				
Economic Development Cooperation Fund (EDCF): US\$36.06 million				
Borrower: US\$18.18 million				
Program Total: US\$468.45 million				
<b>B. Key Dates</b>				
Process	Date	Process	Original Date	Revised / Actual Date(s)
Concept Review:	02/02/2009	Effectiveness:	03/04/2011	03/30/2011
Appraisal:	04/19/2010	Restructuring(s):		03/17/2015 02/16/2016 12/30/2016
Approval:	08/26/2010	Midterm Review:	09/30/2014	09/24/2014
		Closing:	03/31/2015	12/31/2016
<b>C. Ratings Summary</b>				
<b>C.1 Performance Rating by ICR</b>				
Outcomes:		Satisfactory		
Risk to Development Outcome:		Low		
Bank Performance:		Moderately Satisfactory		
Borrower Performance:		Moderately Satisfactory		
<b>C.2 Detailed Ratings of Bank and Borrower Performance (by ICR)</b>				
Bank	Ratings	Borrower	Ratings	
Quality at Entry:	Satisfactory	Government:	Moderately Satisfactory	
Quality of Supervision:	Moderately Satisfactory	Implementing Agency/Agencies:	Moderately Satisfactory	

<b>Overall Bank Performance:</b>	Moderately Satisfactory	<b>Overall Borrower Performance:</b>	Moderately Satisfactory
<b>C.3 Quality at Entry and Implementation Performance Indicators</b>			
Implementation Performance	Indicators	QAG Assessments (if any)	Rating
Potential Problem Project at any time (Yes/No):	No	Quality at Entry (QEA):	None
Problem Project at any time (Yes/No):	Yes	Quality of Supervision (QSA):	None
DO rating before Closing/Inactive status:	Moderately Satisfactory		
<b>D. Sector and Theme Codes</b>			
		<b>Original</b>	<b>Actual</b>
<b>Major Sector/Sector</b>			
Energy and Extractives			
• Energy Transmission and Distribution		97	97
• Public Administration - Energy and Extractives		3	3
<b>Major Theme/Theme/Sub Theme</b>			
Environment and Natural Resource Management			
• Climate change		93	93
○ Mitigation		93	93
Urban and Rural Development			
• Urban Development		100	100
○ Urban Infrastructure and Service Delivery		100	100
<b>E. Bank Staff</b>			
Positions	At ICR	At Approval	
Vice President:	Makhtar Diop	Obiageli Katryn Ezekwesili	
Country Director:	Bella Deborah Mary Bird	John McIntire	
Practice Manager/Manager:	Sudeshna Ghosh Banerjee	Subramaniam Vishwanathan. Iyer	
Project Team Leader:	Mirlan Aldayarov	Pankaj Gupta	
ICR Team Leader:	Dante Ariel Mossi Reyes		
ICR Co-author:	Imtiaz Hizkil		

## F. Results Framework Analysis

### Project Development Objectives (from Project Appraisal Document)

The objective of the Project is to increase availability, reliability, and quality of grid based power supply to northern regions of Tanzania<sup>1</sup>.

### Revised Project Development Objectives (as approved by original approving authority)

There was no change of PDO.

#### (a) PDO Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
<b>Indicator 1:</b>	Maximum transmission capacity in the subsystem (MW) <sup>2</sup>			
Value (quantitative or qualitative)	200 MW	1,200 MW		1,200 MW <sup>2</sup>
Date achieved	03/30/2011	03/30/2011		12/31/2016
Comments (including % achievement)	Target Fully achieved – based on TANESCO project reports			
<b>Indicator 2:</b>	Reduction in transmission losses in the subsystem (in percent)			
Value (quantitative or qualitative)	6 percent	3 percent		3 percent
Date achieved	03/30/2011	03/30/2011		12/31/2016
Comments (including % achievement)	Target Fully achieved – based on TANESCO project reports			
<b>Indicator 3:</b>	Cumulative power outages that are linked to malfunctions in the subsystem (days)			
Value (quantitative or qualitative)	7 days	3 days		4 days
Date achieved	03/30/2011	03/30/2011		12/31/2016
Comments (including % achievement)	This target was partially achieved – based on TANESCO project reports			
<b>Indicator 4:</b>	Reduction in the number of power outages that are linked to malfunctions in the subsystem (absolute numbers)			
Value (quantitative or qualitative)	30	10		4
Date achieved	03/30/2011	03/30/2011		12/31/2016

<sup>1</sup> The PAD and Credit Agreement version are the same.

<sup>2</sup> Transmission capacity will increase to 2,000 MW once the transmission line operates at 400 kV, in the second phase, not being financed by IDA.

Comments (including % achievement)	Target exceeded by 60 percent – based on TANESCO project reports.
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**(b) Intermediate Outcome Indicator(s)**

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
<b>Core - restated</b>	Transmission lines constructed or rehabilitated under the project			
Value (quantitative or qualitative)	0.0 km	447.0 km		447.0 km
Date achieved	03/30/2011	03/30/2011		12/31/2016
Comments (including % achievement)	Fully achieved. This core indicator was introduced in the restructuring of 02/16/2016.			
<b>Indicator 1:</b>	Transmission line from Iringa to Dodoma including Fiber Optical Communication Line (FOCL) constructed (km)			
Value (quantitative or qualitative)	0.0 km	225.0 km		225.0 km
Date achieved	03/30/2011	03/30/2011		12/31/2016
Comments (including % achievement)	Fully achieved – based on BTIP Project Completion Report (Fichtner)			
<b>Indicator 2:</b>	Transmission line from Dodoma to Singida including FOCL constructed (km)			
Value (quantitative or qualitative)	0.0 km	217.0 km		217.0 km
Date achieved	03/30/2011	03/30/2011		12/31/2016
Comments (including % achievement)	Fully achieved – based on BTIP Project Completion Report (Fichtner)			
<b>Indicator 3:</b>	Electricity transmission line from Singida to Shinyanga including FOCL constructed (km)			
Value (quantitative or qualitative)	0.0 km	225.0 Km		228.0 Km
Date achieved	03/30/2011	03/30/2011		12/31/2016
Comments (including % achievement)	Target exceeded by 1.3 per cent, because of adjustments during contract implementation, – based on BTIP Project Completion Report (Fichtner)			
<b>Indicator 4:</b>	Substation upgraded (number)			
Value quantitative or qualitative	0	4		4
Date achieved	03/30/2011	03/30/2011		12/31/2016
Comments (including % achievement)	Fully achieved – based on BTIP Project Completion Report (Fichtner)			
<b>Indicator 5:</b>	Timely and satisfactory implementation support provided during the construction of the transmission line			
Value (quantitative or qualitative)	None	Satisfactory completion of transmission line		Transmission Line was satisfactory completed
Date achieved	03/30/2011	03/30/2011		12/31/2016

Comments (including % achievement)	Fully achieved			
<b>Indicator 6:</b>	Staff trained in environmental and social issues (number)			
Value (quantitative or qualitative)	0	10		11
Date achieved	03/30/2011	03/30/2011		12/31/2016
Comments (including % achievement)	Target exceeded by 10 percent. The project opted for a Training of Trainers approach, and trained two staffers who in turn trained nine staff at TANESCO, which resulted in an increase of trained environmental and social staff from seven to eighteen.			
<b>Indicator 7:</b>	Technical feasibility study for hydropower project completed			
Value (quantitative or qualitative)	None	Feasibility study completed		Feasibility study was completed.
Date achieved	03/30/2011	03/30/2011		12/31/2016
Comments (including % achievement)	Fully achieved – feasibility study for the Rumakali Hydropower Plant completed.			
<b>Indicator 8:</b>	Power generation projects developed (number)			
Value (quantitative or qualitative)	None	Satisfactory progress in development and financing of generation projects		1
Date achieved	03/30/2011	03/30/2011		12/31/2016
Comments (including % achievement)	Fully achieved. The Bank financed technical assistance for preparation of The Singida Wind Farm project, which included services of transaction advisers who provided technical, legal and financial assistance to TANESCO – the developer of the wind farm project. This indicator was defined as having prepared a feasibility study and the necessary documentation to request private sector participation from the market.			

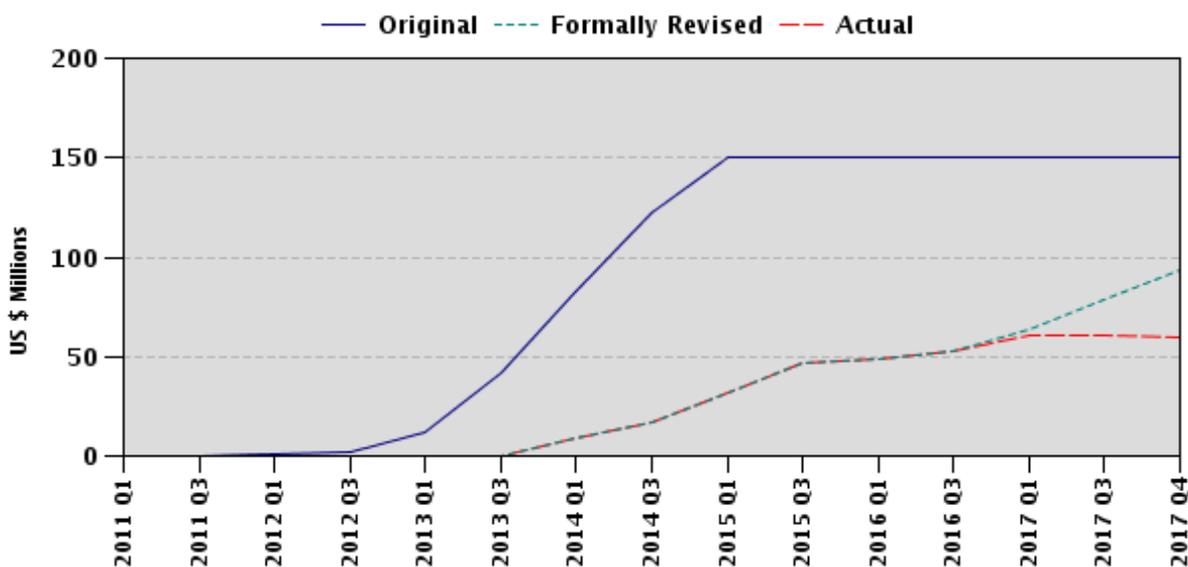
## G. Ratings of Project Performance in ISRs

No.	Date ISR Archived	DO	IP	Actual Disbursements (US\$, millions)
1	03/14/2011	Satisfactory	Satisfactory	0.00
2	11/02/2011	Satisfactory	Satisfactory	0.00
3	06/13/2012	Satisfactory	Satisfactory	0.00
4	01/25/2013	Satisfactory	Satisfactory	0.00
5	10/27/2013	Satisfactory	Moderately Unsatisfactory	16.81
6	07/06/2014	Moderately Unsatisfactory	Moderately Unsatisfactory	24.57
7	04/20/2015	Moderately Unsatisfactory	Moderately Unsatisfactory	47.27
8	12/17/2015	Moderately Unsatisfactory	Moderately Satisfactory	49.22
9	06/14/2016	Moderately Satisfactory	Moderately Satisfactory	56.33
10	02/06/2017	Moderately Satisfactory	Moderately Satisfactory	56.94

## H. Restructuring (if any)

Restructuring Date(s)	Board Approved PDO Change	ISR Ratings at Restructuring		Amount Disbursed at Restructuring in US\$, millions	Reason for Restructuring and Key Changes Made
		DO	IP		
03/17/2015	No changes	S	MS	46.77	Extension of project closing date from March 31, 2015 to December 31, 2016
02/16/2016	No changes	MU	MS	47.87	Partial cancellation of project savings of SDR 40.5 million (approximately US\$56.0 million) in Component 1, recommitment to other national priorities, and retrofitting an indicator to a core indicator definition for transmission line– the cancellation is a result from cost savings caused by lower prices of awarded contracts under the procurement process.
12/30/2016	No changes	MS	MS	60.54	Partial cancellation of unused funds for SDR14.0 million (approximately US\$18.8 million) and recommitment to other national priorities – which did not cause a revision of expected disbursements.

## I. Disbursement Profile



## **1. Project Context, Development Objectives and Design**

### **1.1 Country and Sector Context at Appraisal (2010)**

1. **The United Republic of Tanzania had an estimated population of 49 million with a land area of 945,203 sq. km.** The economy of Tanzania depended heavily on agriculture, which accounted for around 25 percent of the GDP and employed two thirds of the work force. The economy expanded rapidly from an average of 3.5 percent in the 1990s to an average of 7.0 percent in the 2000s – one of the best performers in Sub-Saharan Africa. The economic growth was fueled by export growth, improved tax revenues, foreign aid, and debt relief, which created more fiscal space for public spending, from about 16 percent of GDP to 28 percent of GDP in 2009.

2. **The impressive growth performance in the 2000s did not translate into a significant reduction in poverty** - which only fell from 35.6 percent to 33.6 percent from 2001 to 2007. The 2007 Household Budget Survey (HBS) revealed disappointing results in poverty reduction since 2001 - an increase of 1.3 million of poor people. World Bank analysis suggested that some of the causes for these results could be attributed to structural weaknesses in the development of infrastructure and human capital, as well as inadequate management of natural resources.

3. **Tanzania's bountiful energy resources co-existed with widespread energy poverty.** Tanzania's electrification rate was 15 percent (only 4 percent in rural areas), despite the fact that Tanzania has been endowed with diverse energy sources including natural gas, hydropower, coal, geothermal, solar, wind and biomass which largely remained untapped. The country's installed power generation capacity was mainly based on hydropower (56 percent) and natural gas (34 percent). The hydro-dominated generation system was vulnerable to drought especially during peak demand periods and large parts of the country experienced major load shedding. Some regions, districts, and towns were dependent on isolated diesel-run generators.

4. **The energy sector was headlined by four major institutions.** The Ministry of Energy (MoE) set policies and strategies for the energy sector. Under MoE, the Energy and Water Utilities Regulatory Authority (EWURA) operates as a regulatory agency responsible for technical and economic regulation of the electricity, midstream and downstream petroleum and natural gas, and water sectors. Its functions include licensing, tariff setting, and promoting effective competition and economic efficiency, and protecting the interests of consumers. The cornerstone of the sector is the state-owned utility TANESCO, responsible for electricity generation, distribution, transmission, and sale of electricity to the Tanzanian mainland and bulk power supply to the island of Zanzibar. The Rural Energy Agency (REA) has the mission to promote and facilitate availability and access to modern energy services in rural mainland Tanzania. REA implements grid extension in rural areas; supports private sector small-scale rural power generation projects (both grid and off-grid); and provides technical assistance, training, and capacity building to private developers for project planning, preparation, and financing.

5. **Power shortages were imposing enormous cost to the Tanzanian economy.** During the severe droughts of 2009 and 2011, Emergency Power Producers (EPPs), located mostly around Dar es Salaam, were also used to address the power supply shortage due to weak hydropower performance and constraints in transmission system due to underinvestment since the 1980s. The energy crisis that occurred over the decades, mainly caused by drought, thus highlighted the

importance of reliable energy supply for economic growth and poverty alleviation. Consequently, in 2007, the national power utility TANESCO identified urgent transmission and distribution investments to improve the capacity of existing networks thus improving power system performance by reducing system losses, frequent outages due to overloaded transformers and old equipment, low and fluctuating voltage conditions and poor power factors. The **Backbone Transmission Investment Project (BTIP)** was a crucial element in this plan.

6. **The BTIP was declared a national priority project by the President’s office and was included in TANESCO’s Capital Investment Plan and under Tanzania’s ‘Big Results Now’ initiative.** The transmission network, managed by the single vertically integrated national utility - Tanzania Electric Supply Company Limited (TANESCO), was limited to connecting the main cities, and was facing physical limitations to meet growing energy demand. According to TANESCO’s Power System Master Plan (2009), the national peak installed capacity was expected to grow in the range of 2,000MW and 6,000MW to meet the 7.9 percent growth in demand for the next decade. It was recognized that Tanzania had a high potential for harness domestic energy resources to ensure sufficient and reliable supply to support economic growth.

7. **BTIP was designed as the first 400kV power highway to balance the demand and supply load centers within the country and as gateway to regional interconnectors within the Eastern and Southern Africa region.** The Backbone transmission line (see figure 1) was expected to provide three benefits: (i) Availability of bulk electricity: increasing the capacity of bulk power transfer to the demand centers around Dodoma and Mwanza would enable an increase in access to the grid in the region. Growth in demand for electricity in these regions implied that the existing infrastructure was capacity constrained and hampering economic activity – curtailing consumption of existing customers and the ability to add new customers; (ii) Reliability and efficiency of power supply: as the existing infrastructure was over-loaded and operating at full capacity, transmission line losses and breakdowns had a significant impact on customers in the region. The double-circuit 400-kV line operates in addition to the existing 200-kV line, thus adding resilience to the supply infrastructure. The additional transmission capacity reduced the strain on existing infrastructure and of technical losses of electricity<sup>3</sup>; and (iii) Regional transmission corridor: The BTIP transmission line was part of the regional transmission corridor between Ethiopia, Kenya, Tanzania and Zambia (EKTZ). The BTIP enabled a 400-kV interconnection with Kenya (which was under design), which will be linked to the Kenya; and the BTIP could be extended South from Iringa to interconnect with Zambia (project is currently under preparation). The backbone was expected to become the main conduit for regional power flows in the future and a critical enabler of power trade between the EAPP and SAPP.

8. **The benefits of BTIP were measured in terms of the avoided thermal generation in the north, mostly HFO or diesel, which were substituted by the power generation from hydroelectric dams and gas-fired generation plants in the south.** The project was designed against the backdrop of the PSMP of 2009, which had identified future load growth from increased

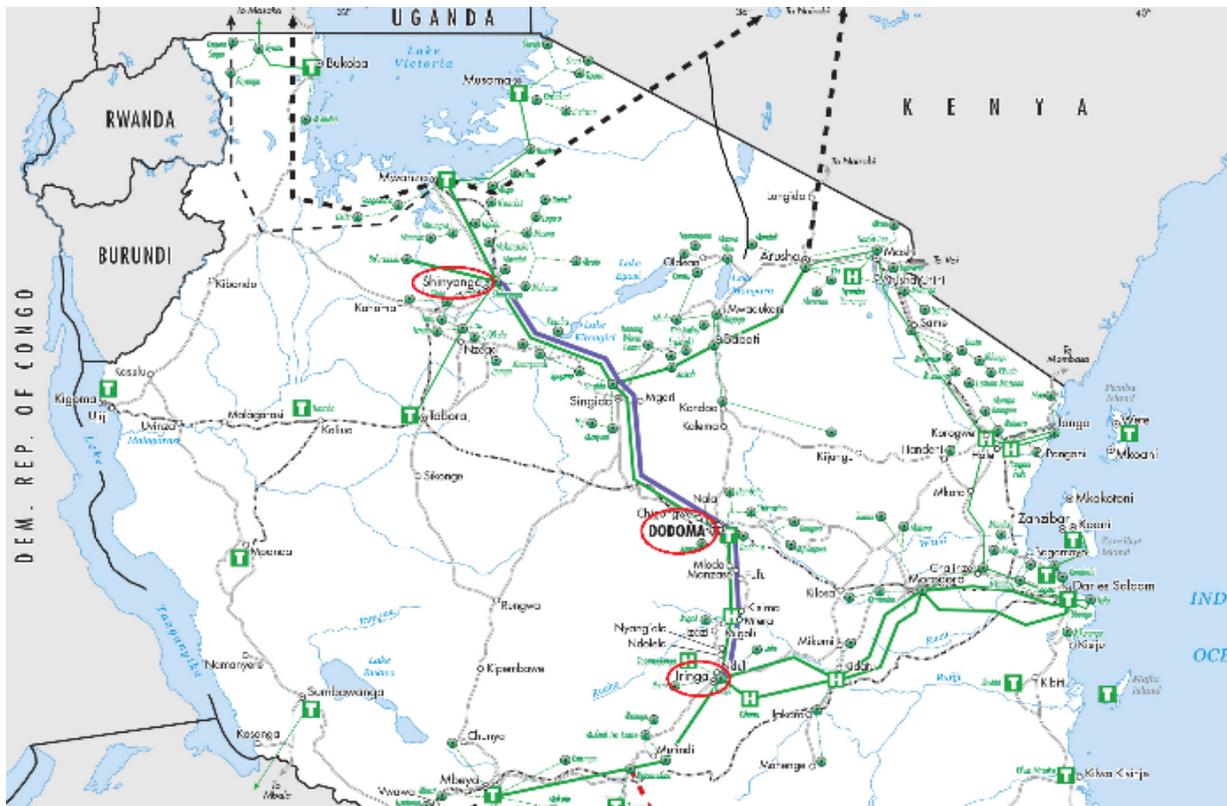
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<sup>3</sup> A reduction in outages results in an increase to the quality of service to electricity customers which is now considered an attribute of electricity service in the multi-tier framework (MTF). An increase in the tier of service is thus an increase in electricity access, “Beyond Connections: Energy Access Redefined”, ESMAP, 2015

economic activity and further urbanization in the north of the country, with most of the supply (hydroelectric dams, and gas power plants located in the south and southeast). Therefore, the BTIP would have the additional benefit of not only transporting energy from the generation sites to the demand centers, but also, substituted HFO/diesel for renewable energy, thus resulting in a net reduction of CO<sup>2</sup> emissions.

9. **The GoT decided to proceed with BTIP in phases and this project represents the first phase.** In Phase 1 (670 km long double circuit over-head line from Iringa to Shinyanga), they would build the 400kV double line with both circuits strung, operated at 220kV, and, during Phase 2, a system upgrade would be carried out to operate at 400kV and to be completed by 2020. The follow up Phase 2, is being financed by the rest of the donors and the supplemental construction works are ongoing.

**Figure 1: The Tanzania Backbone Transmission Line**



**1.1 Rationale for Bank Involvement**

10. **The Joint Assistance Strategy (JAST) for Tanzania (2006) highlighted lack of energy as one of the key development focus area.** From the broader development perspective, the World Bank supported the efforts of the GoT to establish enabling conditions for sustainable development and reliable energy provisions for economic growth and poverty alleviation. By increasing the availability and reliability of electricity in the northern part of the country, the Project was not only supporting the Government’s growth and poverty alleviation efforts that access to electricity bring

in terms of social economic benefits, but also facilitating the conditions for private sector development of commercial activity in the northwestern provinces of Tanzania.

11. **The Bank was also expected to play a convening role in bringing together development partners in the design and implementation of BTIP.** The Project was prepared through a consultative approach with other key donors (AfDB, EIB, JICA, EDCF, Norway and Sweden) who have jointly supported the preparation of the BTIP with the World Bank. The collaboration and coordination were expected to continue through project implementation.

## **1.2 Original Project Development Objectives (PDO) and Key Indicators (as approved)**

12. The PDO of the project is to increase availability, reliability, and quality of grid based power supply to northern regions of Tanzania.

13. The progress of the PDO outcomes was measured by the following Project Outcome Indicators:

- (a) Maximum transmission capacity in the subsystem<sup>4</sup> (in MW)
- (b) Reduction in transmission losses in the subsystem (in percent)
- (c) Cumulative power outages that are linked to malfunctions in the subsystem (in days per year); and
- (d) Reduction in the number of power outages that are linked to malfunctions in the subsystem (in absolute numbers [in a year])

## **1.3 Revised PDO (as approved by original approving authority) and Key Indicators, and Reasons/Justification**

14. There were no PDO revision during the implementation period of the project. The only changes introduced to Key Indicators were related to the change of the closing date extension and the introduction of a new core indicator.

## **1.4 Main Beneficiaries**

15. The project had both national and regional benefits. Regarding the former, electricity consumers in Tanzania were expected to be the main beneficiaries of the Project though the PAD did not specify them as such. They received a more reliable electricity supply made possible by allowing conditions for improved availability and reliability of supply. Measures to report reduction of periodic supply interruptions from the occasional overloading of the transmission system also showed improvement. TANESCO, as a utility, also benefited from increased technical, legal, financial and safeguard capacity to manage larger capital intensive infrastructure projects.

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<sup>4</sup> The project supports and enhances the ‘subsystem’ within the whole transmission network in place, and it comprises the existing 220kV transmission line from Iringa-Dodoma-Singida-Shinyaga and the new 400kV line from Iringa-Dodoma-Singida-Shinyaga. The ‘subsystem’ was designed to supply electricity at high voltage levels to private and public high voltage consumers, including mines. Therefore, tangible improvement that were measurable in normal operation of this subsystem were the ones being measured.

Regarding the latter, the Project had the potential to benefit electricity consumers in neighboring countries through interconnections with Kenya and Zambia, of which the BTIP is a key part.

### **1.5 Original Components (as approved)**

16. The Project consisted of two components:

17. **Component 1. Construction of Overhead Transmission Line from Iringa to Shinyanga.** This component financed overhead 400kV double-circuit backbone transmission interconnection between the towns of Iringa and Shinyanga, including the Fiber Optic Communication Line (FOCL) and the Shield Wire System (SWS) and expanding the associated 220kV substations at Iringa, Dodoma, Singida and Shinyanga.

18. **Component 2. Technical Assistance.** This component financed provision of technical assistance to the Project Implementing Unit (PIU) (within TANESCO) through consultancy contracts for: (a) implementation support; and (b) strengthening of technical, legal, financial, and safeguards capacity.

### **1.6 Revised Components**

19. The components of the project were kept without change, although the amount of resources allocated for those components was reduced to adjust for the significant project savings resulting from the procurement process for the transmission facilities. The project went through three restructurings. The first restructuring, approved on March 17, 2015, resulted in the extension of the Closing Date by 21 months to December 31, 2016, to adjust for delays in implementation. The second restructuring, as of February 16, 2016, resulted in the first partial cancellation of 39.76 million SDR to account for savings resulted from procurement (cost of Component 1 was therefore reduced from US\$140 million to US\$84 million). The third and last restructuring, on December 30, 2016, the cost of the Component 1 was once again reduced from US\$84 to US\$57 million, while the cost of Component 2, was reduced from US\$10 million to US\$6.4 million.

### **1.7 Other Significant Changes**

20. N/A

## **2. Key Factors Affecting Implementation and Outcomes**

### **2.1 Project Preparation, Design and Quality at Entry**

#### ***Soundness of the background analysis.***

21. The BTIP was prepared by the Government, with the financial and technical support from an ongoing IDA operation, Tanzania Energy Development and Access Expansion Project (TEDAP) (P101645). The project was part of TANESCO's Capital Investment Plan and under Tanzania's 'Big Results Now' initiative. The Project was set to finance a new 667 km HVAC transmission line from Iringa to Shinyanga, linking existing and future generating sources in the southern regions of Tanzania to the load centers in the Mwanza and Arusha regions in northern Tanzania. In the medium to long term the BTIP was expected to facilitate power trade in the region

in the context of multi-purpose water and energy resources development by providing the critical link between the Eastern Africa Power pool (EAPP) and the Southern Africa Power Pool (SAPP) linking Tanzania with Kenya in the north and Zambia in the South. The Project was therefore regarded as a vital element of national energy system, opening the window or providing a foundational support to many local and regional transformational projects.

22. Even then, the background analysis overstated the cost of building the BTIP by a substantial margin. The background analysis was vetted by the participation of multitude of development partners. The Project brought together a 5 member donor group which included AfDB; EIB; JICA; and EDCF; aside from the World Bank. However, this was the first 400 KV transmission highway in the country and various assumptions went into developing a comprehensive cost estimate. A number of subsequent factors contributed to substantial cost savings (see para 31, 54, 55), as a result, the BTIP was completed in a much more economical manner than initially anticipated.

### *Assessment of project design*

23. **Project objectives.** The Project had a clear and precise PDO and established a clear connection between its activities and the PDO. The activities under the credit - construction of the transmission line, rehabilitation of the substations along the line's route, and a comprehensive technical assistance program aimed at increasing TANESCO's capacity to handle large infrastructure projects, were directly contributing to increase of availability, reliability and quality of the power supply.

24. **Project design and components.** The Project had a straightforward design: two components with well-articulated description of types of activities supported by the loan proceeds. The first component was the building of transmission infrastructure, where the donor group including African Development Bank (AfDB); European Investment Bank (EIB); Japan International Cooperation Agency (JICA) and Korean Economic Development Cooperation Fund (EDCF), financed segments of the three sections of the transmission line, and the rehabilitation of four substations. All lots were interrelated and transmission system could not be launched until all works were completed by all donors. The implementation of this component was the sole responsibility of TANESCO. The second component was aimed at supporting the Project management, coordination of environmental and social (E&S) issues, and financing the services of by the Owners Implementation Support Firm (OISF). The Project did not have a separate donor coordinating body, as the PIU at TANESCO took the lead in coordinating the development partners which financed the BTIP. To address the importance of maintaining the financial viability of TANESCO, the Project agreement included legal covenants which would keep the PIU under close supervision from the Bank related to financial indicators.

25. **Adequacy of government's commitment and assessment of risks.** The GoT provided full support to the Project, TANESCO and the donors at the design and appraisal stages. The Project was high on the list of the Government's priorities and supported and contributed to achievement of goals of the 2005 National Strategy of Growth and Reduction of Poverty (NSGRP) (namely, its Goal 6: Provision of reliable and affordable energy to consumers).

26. The Project's risks assessed adequately at appraisal. The Bank correctly identified two major risks. First, TANESCO's procurement and safeguards capacity risks and addressed it with a technical assistance package to TANESCO for hiring a project management/ procurement advisory firm. Second, TANESCO financial sustainability risk and addressed it by including financing indicators as legal covenants. However, as the Project demonstrated the non-compliance of TANESCO with such covenants had almost no effect on the progress of Project implementation.

27. The Bank, however, failed to identify the risk of considerable delays that could be caused by lack of proper coordination between donors during the implementation stage. The Joint Missions arrangement, envisaged by the Project with the goal of improving donor coordination proved itself insufficient. The Project demonstrated that lack of elaborated mechanisms that could quickly address disagreements between donors with regards to procurement decisions can significantly postpone the start of the Project's implementation.

## **2.2 Implementation**

28. The BTIP was the first project of such scale and technical complexity for TANESCO. It was also a first project of such scale in Tanzania, which involved parallel co-financing: The Project was implemented by five donors, responsible for completion of certain parts of the transmission line.

29. **The Project experienced significant delays in effectiveness and during implementation.** The Project became effective two months after expected effectiveness date due to delay in issuance of Legal opinion by country's Attorney General. However, the longest delays were caused by more complex (than anticipated) coordination amongst the five lenders on procurement matters. In addition, given that some differences have been identified between the procurement guidelines of some lenders, it required an additional clearance by the Operational Procurement Review Committee (OPRC) at the World Bank level. Situation was worsened by limited capacity within TANESCO to handle complex projects which resulted in lengthy periods required by TANESCO to reply to donors' objections/commentaries to some procurement solutions. As a result, it took more than 30 months (November 2010 to August 2013) to process major contracts under the Project from initiation of prequalification to award of the contracts.

30. **The project had significant cost savings that were recommitted to the country.** The main reasons for the cost savings were as follows: (i) joint bidding process, which despite causing delays in the project implementation, nevertheless indeed resulted in lower prices for the Project, and (ii) in addition to bidding-related economies of scale, historically low commodity prices, combined with favorable exchange rates also contributed to significant savings. Since savings materialized only during the last months of the Project's implementation, the decision was made by the team and TANESCO to partially cancel the undisbursed saved funds in the amount of US\$18.76 million equivalent, and they were recommitted to other country priorities (See section 3.3 for additional detail).

31. **Technical assistance component contributed to successful completion of the Project.** The Project financed services of the Owner's Engineer which served as a coordinator and quality supervisor of construction and testing on the ground, servicing all the Project's donors. TANESCO was also strengthened with personnel trainings to increase the staff's capacity to work with the

Project. Several activities under the Technical Assistance Component, however, were not completed by the Closing Date. In particular, the Bank financed the services of an investment bank to facilitate the preparation of a Power Purchase Agreement with a private investor. This work was expected to be followed up with an investment in Singida Wind Farm - a 100 MW wind power facility. Although technical, legal and financial assistance was provided to TANESCO for preparation of the Project, the financial closure was not achieved at the Closing Date, as TANESCO had to focus all its efforts on finalization of the BTIP. The other subcomponent – financing of the feasibility study for the Rumakali Hydroelectric Power Station was dropped by TANESCO due to its decision to fund the study out of its own resources. Perhaps, the most important achievement in this component, was the empowerment of TANESCO staff, to learn how to successfully manage and complete a large-scale project with multi-donor financing, including all fiduciary aspects, such as financial management, procurement, social and environmental safeguards.

32. **TANESCO’s Environmental and Social Capacity Building efforts were significant.** At negotiations of the BTIP, TANESCO’s environmental and social unit consisted of four environmental officers/engineers (the head of the unit plus three officers), two surveyors/technicians, and one sociologist. The commitment from TANESCO was to add an environmental officer, two surveyors, and one sociologist. TANESCO fulfilled and substantially exceeded that commitment; the unit was upgraded to an Environment Department and it now consists of the manager (who is an environmental specialist), six environmental officers/technicians, six surveyors, one surveyor technician, and four social scientists. TANESCO has increased its environmental and social staff from seven to 18, to the benefit not only of BTIP but also TEDAP and its other development projects, both donor-financed and self-funded.

33. **Overall, the World Bank’s supervision helped to identify delays in real-time and to build a dialogue between donors which contributed significantly towards successful Project completion.** The implementation delays were overcome after the World Bank, TANESCO in cooperation with the Owner’s Engineer undertook the task of leading the completion implementation. Under much pressure from TANESCO, and help from the Bank, the contractors sped up subsequent implementation activities. As a result of the constant joint attention to the implementation timeline, most of the works under the project were completed by the revised Closing Date.

### **2.3 Monitoring and Evaluation (M&E) Design, Implementation and Utilization**

34. **Design.** Overall, the M&E framework captured the Project’s objectives, however, it did not allow for proper monitoring of the Project’s progress, since PDO indicators could only be monitored at the completion of the Project, when the transmission line was put into operation and relevant data could be collected. The achievement of one of the intermediate indicators (namely, “Indicator 5: Timely and satisfactory implementation support provided during the construction of the transmission line”) was to be measured based on a subjective criterion and, it was not clear what “timely” and “satisfactory” meant in the Project’s context.

35. **Implementation and Utilization.** The M&E framework, therefore, was not fully utilized serving as a collection of Project’s targets, but not as a collection of tools helping the Bank to timely react to the implementation volatilities. The Bank did not make efforts to adjust the M&E

framework and to replace the indicators with more instrumental ones. Two intermediate indicators (6 and 7) became obsolete long before the project Closing Date – one due to the fact that TANESCO decided to finance the activities covered by the indicator from its own funds, and another after it became obvious that goal of development of the wind power plant was too ambitious and unrealistic for the Project. The abovementioned problem with the M&E framework, however, did not affect the achievement of the PDO - the team monitored the Project's progress based on procurement milestones and utilizing the advisors with such complex projects. The problems during implementation, including the difficulties with the procurement packages were timely identified during the supervision missions and agreement was reached on efforts needed to speed up the process and to bring the Project's progress in line with the initial schedule

## **2.4 Safeguard and Fiduciary Compliance**

36. **Safeguard Compliance.** The Project triggered four safeguard policies: Environmental Assessment, Natural Habitats, Physical Cultural Resources, and Involuntary Resettlement. The project had been initially classified as Category B, as potential impacts were not expected to be complex, sensitive or irreversible. The environmental category was changed to Category A at Quality Enhancement Review (QER) of the World Bank in order to have a consistent approach to safeguards implementation among the Joint Lenders to the project.

37. The PIU of TANESCO was fully staffed to address the environmental and social issues. During project preparation and implementation, TANESCO increased its dedicated environmental and social staff from 7 to 18; the unit included a manager, an environmental specialist, six environmental officers and technicians, six surveyors, one surveyor technician, and four social scientists. Those specialists not only supported the backbone project but also provided support to other donor-funded projects.

38. TANESCO and its contractors implemented the project's ESIA and associated ESMP in a satisfactory manner. There were no significant issues of non-compliance with the triggered environmental safeguards policies. The training supported by the project substantially improved TANESCO's safeguards capacity.

39. The Project affected 2,389 PAP household members and required preparation of RAP. TANESCO provided the PAPs with necessary compensations (funded out of its own budget) and overall the progress of the implementation of RAP has been satisfactory throughout the implementation period. Although the Project initially registered quite a high number of complaints, received by the grievance committee, all of them were resolved. The implementation of RAP with regards to compensations faced multiple challenges, due to, for example, customary nature of land ownership, which made the measurement of properties not always very reliable. TANESCO's internal budgeting processes was another challenge to proper RAP implementation: lengthy periods required for internal approvals at times affected the timeliness of compensation payments. The Bank closely monitored implementation of RAP and has not identified any unresolved issue by the extended project closing Date.

## **Financial Management**

40. The World Bank's financial management team conducted regular monitoring of TANESCO's financial management systems, including accounting, reporting, budgeting, flow of funds, and staffing, and found that systems were overall satisfactory. The financial management and disbursement arrangements were well established and operated properly throughout the project: qualified staff was available, the project's internal controls were in place, the Designated Account was operational, and the authorized signatories were available. The project was in compliance with its quarterly interim financial reporting requirements. TANESCO audit reports were submitted on time and were properly disclosed. The project audit reports were also submitted on time and clean audit reports were issued. No substantial weaknesses in internal controls were identified by the auditors.

## **Procurement**

41. The procurement reviews were made on a regular basis and have not revealed any irregularities in procurement aspects of the project implementation. TANESCO and OISF closely monitored all procurement procedures with due diligence and in accordance with the legal agreements. The World Bank concluded that all procurement procedures were conducted in accordance with commercial practices and followed a competitive approach. In fact, the procurement of the works contract generated significantly lower prices for the large scale of the contracts involved, international competition, and the end of the commodity price cycle, which benefited the efficiency of the project (see para 54, 55).

42. The procurement was arranged in four major lots for works (three individual lots for the transmission lines and one lot for the substations) which was completed with some significant delays. It took more than 30 months (November 2010 to August 2013) to process the major contracts under the Project from initiation of prequalification to award of the contracts. This was mainly due to (i) the decision to have a joint bidding process for the three lots related to the transmission line, which was aimed at reducing total Project costs through discounts from possible multiple awards; and (ii) limited capacity within TANESCO to handle complex projects. The joint bidding process demanded accommodation of the requirements from all lenders in the process, which was time consuming. Due to limited capacity within TANESCO, and the internal approvals required within TANESCO, the various stages of the bidding also took more time than anticipated.

43. There were two major contracts related to the services in the technical assistance component - the supervision consultancy of the Backbone transmission line construction and the Singida Wind Farm Transaction Adviser. These contracts did not face challenges in the procurement process. In the case of the Transaction Advisory Consultant for the Singida Wind Farm project, Phase 1 of the contract was completed in January 2014, and its associated final report was approved by TANESCO in February 2014. In March 2014, TANESCO signed Phase 2 of the Transaction Advisory Contract, starting the stage for commercial negotiations on a Power Purchase Agreement with the developer.

## **2.5 Post-completion Operation/Next Phase**

44. Tanzania, as a member of both SAPP and EAPP, has expressed the interest to continue developing key transmission infrastructure to improve its regional connectivity to the wholesale energy market and participate in bilateral transactions. During the months following Project completion, TANESCO has started discussions on power trade with other regional connectors in Kenya and Zambia. TANESCO also considers the backbone project as a major conduit to commercial activities as several major industrial producers expressed interest in expanding their operations to the north of the country, if TANESCO provides quality electricity services. TANESCO has since moved on to two major transmission projects. The Phase 2 of the backbone is financed by project savings, recommitted by the other donors, to finish the upgrade of the transmission line to 440kV. The Bank (along with AFD) is currently preparing Tanzania-Zambia Interconnector Project, which will be utilizing the experience and benefits of BTIP and will finance a Program to establish cross-border transmission capacity between the SAPP and the EAPP to enable regional power trade.

## **3. Assessment of Outcomes**

### **3.1 Relevance of Objectives**

**Rating:** High

45. The Project remains highly relevant to the objectives of the Bank's CAS for Tanzania FY12-15, which was designed to help the GoT implement its development priorities. At the Project closing date, Tanzania's access to electricity, although increasing, was remaining well below the level of universal or near-universal access needed to propel Tanzania into the group of middle-income countries. Overall, about 33 percent of Tanzanian households were connected to electricity in 2016, with much higher connectivity in urban areas (65 percent) than in rural (17 percent). The Project meets the targets indicated by the National Strategy for Growth and Reduction of Poverty of supplying reliable and affordable energy to consumers – the transmission line will increase the region's competitiveness in terms of industrial and commercial development with related benefits of increasing employment and income.

46. The PDO of increasing availability, reliability and quality of grid based power supply to northern regions of Tanzania was, and continues to be, highly relevant to GoT. Tanzania has maintained an ongoing commitment to increase access to reliable energy, as reflected in Objective 1.4 of Tanzania Country Partnership Framework (CPF) for FY2018-2022. The Project is also in accordance with the National Energy Policy (NEP) updated in 2015, which laid out the mission to provide "reliable, affordable, safe, efficient environment friendly modern energy services to all while ensuring effective participation of Tanzanians in the sector." For the electricity sector, GoT's objectives include inter alia: a) improving security of supply through effective use of energy resources and cross-border trading; b) enhancing power reliability and coverage of transmission and distribution networks. The project strengthens the ability of the country to improve its energy transmission and interconnection to expand the grid between the energy sources located in the south with the population without power, and with load centers which demand most of the electricity in the north. It is also providing critical infrastructure to the regional energy markets of EAPP and SAPP.

### 3.1.1. Relevance of Design and Implementation

**Rating:** Substantial

47. The project design was focused and gave due consideration to the country context. It was simple and established a clear relationship with the PDO. The PDO was clearly defined, and achieved, yet with a significant delay.

48. The PDO indicators were in general well aligned with the project's objectives. The changes to the Project's Results Framework, introduced during the project's term through two project restructurings, were minor and did not affect the direction of the project. The terms and conditions of legal agreements were reasonably designed to address the implementation challenges. The Project experienced significant delays in effectiveness and during implementation, however there were significant cost savings that were recommitted to the country.

### 3.2 Achievement of Project Development Objectives

**Rating:** High

49. The PDO of increasing availability, reliability and quality of grid based power supply to northern regions of Tanzania was achieved. BTIP resulted in construction of new 670 km-long, 400 kV, AC, double-circuit, Over Head Line (OHL) from Iringa to Shinyanga; at the first stage it operated at 220kV with a transmission capacity of 550MW, in order to support the critical situation in the North-Western Grid where the existing single circuit line Iringa-Dodoma-Singida-Shinyanga was operating at its thermal limits. BTIP also upgraded four substations in Iringa, Dodoma, Singida and Shinyanga. The construction works for transmission lines and substations commenced in December 2013 and were finished by the Project's Closing Date.

50. The achievement of the PDO is measured by three factors: 1) availability; 2) reliability and 3) quality of power supply. Achievement of power supply (1) availability was confirmed by the transmission line capable of operating at maximum transmission capacity at the Project's completion. The reliability of the power supply was achieved by reduction of the number of power outages linked to malfunctions in the subsystem (in absolute numbers). The quality of the power supply was measured by reduced number of outages in the system.

51. The Backbone transmission line also created a communications highway. The Project financed the construction of the fiber optical communication line, which was also finalized on schedule by the project closing date, and it has capacity for telecommunications services for the operations of TANESCO, as well as excess capacity that will be used for commercial purposes in an agreement with the Government telecommunications company.

**Table 1. PDO Indicators**

<b>Indicator</b>	<b>Baseline Value</b>	<b>Original Target Values</b>	<b>Actual Value Achieved at Completion</b>
1. Maximum transmission capacity in the subsystem (MW)	200	1,200	1,200
2. Reduction in transmission losses in the subsystem (in percent)	6	3	3
3. Cumulative power outages that are linked to malfunctions in the subsystem (in days)	7	3	4
4. Reduction in the number of power outages that are linked to malfunctions in the subsystem (in absolute numbers)	30	10	4

52. The Project’s created a solid foundation for further cooperation between development institutions in Tanzanian energy sector. The Project’s US\$468 million total costs were co-financed by the following development partners: The World Bank, European Investment Bank, African Development Bank, Japan International Cooperation Agency, and Economic Development Cooperation Fund of South Korea. During the implementation period, TANESCO acquired unique experience of managing the project in an environment requiring a high level of coordination between international institutions and will be applying this experience in its ongoing investment program.

53. The capacity of staff at TANESCO was improved in two significant channels. First, the presence of the OISF in the management of a large infrastructure project, required close interaction with technical and administrative staff of TANESCO. This interaction has resulted in a company with staff more empowered to carry on similar projects in the future, in the process of learning by doing. Second, the capacity of staff for social and environmental safeguards were improved, and later incorporated into the company core functions for its operations and investments.

### **3.3 Efficiency**

#### **Rating: High**

54. The final actual cost of the transmission line and associated substations was 62 percent lower than estimated cost at appraisal (see Annex 3). The economic model follows the original model used at the appraisal stage, which was made available to the ICR team - the model assumes that the construction of the transmission line would take four years and the associated costs from the investment and operation and maintenance are a proportion of the energy transported and that the benefits accrue from the avoided energy, likely thermal, in the north, with a heavy fuel oil plant. The costs of the project changed drastically from appraisal to completion. There are several explanations for these changes; however, it requires some additional insight to understand the changing prices of commodities in the market. The estimated cost at appraisal of the transmission line from Iringa to Shinyanga and its four substations was US\$468.45 million, and after the results from the international procurement processes, the final cost was US\$176.42 million, a reduction of about 62 percent.

55. The estimation of costs during appraisal were carried out at the height of the super commodity cycle of high demand generated by China’s economic expansion; however, once this

global demand began to slow down, prices fell drastically. The U.S. Department of Energy conducted a survey for electrical steel pricing from industrial equipment manufacturers, and it was estimated that the price of steel fell from about US\$2.25 per pound in 2008 to about US\$1.00 per pound in 2011.<sup>5</sup> The increase in prices for steel began in 2003, including grain-oriented electrical steel, and while in 2005 other types of steel moderated, those of grain-oriented electrical steel did not. It was from 2008 that the rapid price reduction began and then stabilized in 2010. The reduction in price during the period was about 55 percent as it can be seen from the figure below.<sup>6</sup> Also, studies such as the Cost Review of Transmission Development in Africa (August 2016) indicates that two thirds of the price of transmission line is for the price of the towers and transmission line, which costs are primarily linked to the price of steel and aluminum.

**Figure 2: Price trends of metallic inputs**

Large Power Transformers and the U.S. Electric Grid



Source: <http://www.ourenergypolicy.org/wp-content/uploads/2014/04/LPTStudyUpdate-040914.pdf>

56. The feasibility study contracted for BITP was commissioned in 2010, with a clear upward expectation of prices, yet, the contracts for the three segments of the transmission lines (Lots 1, 2 and 3) and the substations (Lot 4) under the BITP were signed by August 2013, at the time of the price slowdown cycle (see Table 2). Thus, the reduction of some of the key prices for the project, were totally driven by external factors, that could not have been foreseen in 2010.

<sup>5</sup> Large power transformers and the U.S. Electrical Grid, U.S. Department of Energy, <http://www.ourenergypolicy.org/wp-content/uploads/2014/04/LPTStudyUpdate-040914.pdf>.

<sup>6</sup> Energy Conservation Standard for Distribution Transformers: Notice of Proposed Rulemaking Technical Support Document, <https://www.mercatus.org/system/files/1904-AC04-DOE-Distribution-Transformers-TSD.pdf>.

**Table 2. Milestones of the BITP**

Milestones	Dates	Milestones	Dates
Environmental and Social Impact Assessments (ESIA)	01/2010	Contract signature for Lots 1, 2, 3 and 4	08/2013
		Effectiveness For Lots 1 and 2	11/2013
		For Lots 3 and 4	12/2013
BITP Feasibility Study	02/2010	Completion of contracts	
		Lot 1	04/2016
		Lot 2	12/2015
		Lot 3	07/2016
Lot 4	12/2016		
Consultant EPC bid	01/2013		
EPC contract signature	01/2013		

Source: Fitchner Completion Report.

57. The cost-benefit analysis of the project shows that the short-term investments during the four-year construction period have 30-year horizon of benefits from the energy being transported to the north, avoiding the use of more expensive sources. Even though the planned investments financed by IDA were reduced by about 55 percent because of the procurement savings, the positive flows over 30 years from the energy transport has little impact on the overall return of the investment. A clear benefit is that there is a reduction in the initial debt position of TANESCO, which implies lower future debt service payment, thus adding the planned assets to TANESCO for a lower price. The economic net present value (ENPV) of the project is US\$1.6 billion, increased from the originally estimated US\$1.4 billion at appraisal; and, the economic rate of return (ERR) increased to 42.8 percent, compared with 28.9 percent at appraisal (note that the PAD reported the ENPV and ERR of both phases 1 and 2, and the ICR includes only Phase 1).

58. The model has transmission losses at 3 percent, which coincides with the values observed during the first quarter of 2017, in which the transmission line was put into operation. As soon as the new transmission line was available, it started to carry some additional energy that the earlier and smaller transmission line could not transport because the thermal capacity of the earlier line limited the amount of energy that could be transmitted. During the first quarter of 2017, the transmission line from Iringa to Dodoma registered almost 700MW of additional energy. This is clear evidence that the project achieved its intended PDO.

59. There were also additional project savings in the investment component, of about US\$5.3 million, due to the types of foundations that were finally installed which were less heavy and costly than what was initially evaluated. This was made possible by conducting individual soil tests at each tower with a dynamic light penetrometer device, as requested by the owner's engineer. Also, the monitoring of soil profiles permitted better tower spotting with a reduction in the numbers and heights of the towers.

60. The sensitivity analysis shows that the project not only remained feasible for the country but also benefited from the efficiency of reduced market prices and economies of scale from one

large international competitive procurement process. The result remained robust to significant variations of key parameters, just as predicted at appraisal.

### **3.4 Justification of Overall Outcome Rating**

**Rating:** Satisfactory

61. The overall outcome of the PDO is Satisfactory, based on the high relevance of objectives, substantial rating for relevance of design & implementation, high achievement of PDOs, and high efficiency. However, project implementation was delayed, with an offset by significant cost savings. The operation of the transmission line has provided evidence on how the unserved demand in Dodoma<sup>7</sup> quickly began to be supplied from the additional energy flows.

### **3.5 Overarching Themes, Other Outcomes and Impacts**

#### **(a) Poverty Impacts, Gender Aspects, and Social Development**

62. The project did not include a gender impact analysis.

#### **(b) Institutional Change/Strengthening**

63. By the Project's closing date, TANESCO strengthened its institutional capacity because of the World Bank's support and through gaining unique experience of the Project's implementation. TANESCO further enhanced its expertise in its core functions: transmission of electricity, load management, and further improved its procurement and safeguards capacity. TANESCO has also solidified its capacity to work with independent power producers, through gaining access to a team of transaction advisers, which included technical, legal, and financial experts financed by the World Bank.

#### **(c) Other Unintended Outcomes and Impacts (positive or negative)**

n/a

### **3.6 Summary of Findings of Beneficiary Survey and/or Stakeholder Workshops**

64. Not applicable.

## **4. Assessment of Risk to Development Outcome**

**Rating:** Low

65. The Risk to Development Outcome is rated low. The GoT has developed a longer-term plan for development of the transmission line, including the expansion of the network to reach the key parts of the country with the transmission infrastructure. Both the Government and TANESCO

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<sup>7</sup> Dodoma is the capital city of Tanzania since 1973, and gradually, all government offices are being moved from Dar es Salaam, which requires the provision of additional public services such as housing, schools, and higher availability of electricity in Dodoma.

are actively involved in preparation of the second phase of the Zambia-Tanzania interconnector, which would provide more value added to the network.

## **5. Assessment of Bank and Borrower Performance**

### **5.1 Bank Performance**

#### **(a) Bank Performance in Ensuring Quality at Entry**

**Rating:** Satisfactory

66. Preparation of the Project of such scale required concerted effort of the Bank's, TANESCO's and donors' teams. The World Bank team coordinated preparation activities with TANESCO and GoT to take advantage of an existing IDA-financed project in Tanzania Energy Development and Access Expansion Project (TEDAP) to provide the GoT with enough financial resources to prepare the Project, which was built on the lessons learnt during previous engagements in the energy sector of Tanzania. It was consistent with the Government's sector priorities as well as with the Joint Assistance Strategy of Tanzania (2007). Safeguards and fiduciary mitigation measures were properly designed and consistent with the World Bank's fiduciary role. Risks were assessed, and efforts were made to address them through covenants in the Financing Agreement. The scope of the project was strategically relevant.

67. There were shortcomings in Bank performance as well. First, the Project engaged with donors but did not include organizational arrangements for day-to-day donor project coordination. This was especially important, since TANESCO did not have sufficient capacity to carry out project's supervision during the first years of the Project. Lack of those mechanisms was one of the factors, contributing to two-year delay in the Project's implementation. Second, Project did not include sufficiently nuanced M&E tools to track the Project's progress, since most of the indicators could only be measured at the Project's completion. The Project also did not include any tools to track the progress of Component 2. Third, it became apparent during project implementation that the project costs were substantially overestimated at appraisal, which led to funds cancellation (and recommitted to other development projects in the country).

#### **(b) Quality of Supervision**

**Rating:** Moderately Satisfactory

68. Throughout the project's lifetime the World Bank team was primarily based in Tanzania, which substantially contributed to maintaining a constructive relationship with the client, timely identification, and resolution of risks to the achievement of development objectives. Supervision missions were fielded on a regular schedule, with some being joint supervision missions with other donors - such joint missions helped to promptly target problems as they arose. As a result, a pattern of mutual respect and understanding was developed between the World Bank, co-financiers and the GoT, which helped in overcoming difficulties that kept arising from time to time during implementation. An effective training program on the World Bank safeguards framework, together with the willingness of the TANESCO staff to learn, also contributed to effective implementation.

69. The midterm review produced recommendations which helped to speed up the implementation progress and to carry out restructuring when it was needed. Overall, implementation delays were identified on time throughout the project's term. They were properly monitored and efforts to assist TANESCO and other donors in speeding up the implementation progress were successful.

70. The supervision of the Project was led by three World Bank Task Team Leaders throughout the six years of implementation, from which the first two were based in the World Bank country office of Tanzania. This arrangement allowed the task team leaders to be responsive in real-time to project issues as they arose during the implementation of the project.

### **(c) Justification of Rating for Overall Bank Performance**

**Rating:** Moderately Satisfactory

71. Overall, the World Bank team made impressive and diligent efforts to achieve the PDO. The World Bank team engaged with several stakeholders for preparation the overall project with five different donors, but one single project document, one project engineer, a single set of bidding documents, and joint supervision—was a significant achievement. However, unexpected challenges related to the procurement of large contracts and the verification process among donors was not fully understood, which created challenges to the proposed governance among development partners on obtaining full consensus on procurement decisions in a timely manner.

## **5.2 Borrower Performance**

### **(a) Government Performance**

**Rating:** Moderately Satisfactory

72. The BTIP was declared a national priority project by the President's office at the time of the appraisal and was included in TANESCO's Capital Investment Plan and under Tanzania's 'Big Results Now' initiative. However, despite given a high priority, the Project experienced delays caused by slow governmental approval processes. In particular, the effectiveness of the Project was delayed for several months as the Legal Opinion from the country's Attorney General was not received on time. The Project also experienced delays in financing compensation payment to 2389 PAPs, due to slow governmental budgeting processes. While the need for the project restructuring was clear during the Midterm Review Mission, undertaken in September 2014, the request for restructuring from the GoT was only received in February, 2015, only a month before the Project's original Closing Date.

### **(b) Implementing Agency or Agencies Performance**

**Rating:** Moderately Satisfactory

73. TANESCO was the Project's Implementing Unit and it did not have experience of implementing projects of such scale before BTIP. During the first years of the Project's implementation it became apparent that the company needed significant capacity strengthening in order to be able to exercise its functions as a PIU properly. This resulted in establishing a separate

PIU, which was fully in charge of overseeing the implementation of the project. As the Project proceeded, the PIU increased and improved its staffing including adding transmission and substation engineers, procurement, financial management, and environmental and social officers. The Environment and Social Safeguards Unit doubled its staff to support the project's implementation. After the extension of the original project closing date, TANESCO could considerably accelerate its implementation efficiency and the Component 1 was fully completed by the extended project closing date. The PIU coordinated its work with the OISF closely, which allowed learning experiences from an experienced firm in managing large complex projects.

### **(c) Justification of Rating for Overall Borrower Performance**

**Rating:** Moderately Satisfactory

74. Overall, despite initial implementation delays caused by several factors, both the Government and the Implementing Unit within TANESCO were able to adequately address the implementation challenges and complete the Project by the extended project Closing Date, fully achieving the PDO. Therefore, the Project is rated Moderately Satisfactory

### **6. Lessons Learned**

75. **When designing transmission projects in countries with volatile economic environment it may be reasonable to consider breaking the overall project into multiple phases to have an option of adjusting the projections and investments according to changes in demand expectations.** To avoid the implementation of an oversized solution and to reduce the initial investment costs, a two-stage implementation of the Project's investment component was adopted. The Iringa–Shinyanga transmission line was to be built as a 400kV double circuit line operated at 220kV in a first step, with a capacity of 1,000 MW (500 MW x 2), and was expected to be upgraded to 400kV in a second phase, with a total transmission capacity of 2,000 MW (1,000 MWx2). The upgrade to 400kV operations (Phase 2) was not a part of the Project, and was expected to be undertaken in about seven years after operation of the line was initiated, when the load on the line was expected to increase. This proposed phasing of the investments resulted in cost savings arising out of the 400kV switchgear (transformers, bays, protection, compensation, that will only be installed during Phase 2).

76. **One Project Closing Date extension for a relatively long period with clear signal sent to the client of no further extensions instead of a series of short-term extensions may significantly speed up the implementation process, when the Project is experiencing implementation delays.** When it became clear that the Project completion would not be possible by the originally planned date, the Bank took a decision to approve the Borrower's extension request, but the Bank's team clarified to the Borrower that no further extension would be provided and in case if the Project is not completed on time, the remaining funds would be canceled. This was one of the crucial turning points in the Project implementation, which resulted in significant acceleration of the Project's implementation and brought the Project to a timely completion in accordance with the extended project closing date.

77. **Hiring a reputable international project management advisor helps to address the implementation risk, when the Project Implementing Unit is diagnosed with relatively low**

**project management capacity.** At the design stage, the Bank assessed the low PIU capacity to handle complex projects among one of the Project's risks. The Project was therefore structured to include a component which would finance the services of a specialized firm to assist TANESCO in managing the Project and address capacity constraints of the PIU during the Project implementation. This solution helped to streamline the implementation processes and provided TANESCO with expertise which could be utilized in further engagements with the Bank and other donors.

78. **When undertaking a complex infrastructure project, which involves multiple donors it may be advisable to review the norms on joint bidding and coordinated procurement.** The Project experienced a delay of more than 30 months after its effectiveness, due to a lack of appropriate mechanisms for coordination of procurement decisions by donors and the limited procurement capacity of TANESCO at the time. However, it is important to highlight that the joint procurement actions contributed to a bidding process that reduced the total project cost from multiple discounts and economies of scale. It is recommended that for future multi-donor projects, additional legal arrangements could be introduced suggesting conditions for joint procurement, advanced procurement, and capacity building activities addressing the inherent complexities of harmonizing different processing requirements of development partners.

79. **Having an extended project team in the country office helped deliver better results.** The Bank's team in the country office has established a constructive dialogue with all the stakeholders involved in the Project, thanks to the local presence and ability to respond rapidly to changing project implementation environment. This was very important during the implementation delays as the team could have a clear understanding of project's challenges in real-time while being in close contact with TANESCO, the donors and the GoT.

80. **The use of the owner engineer for the BTIP enabled TANESCO to implement a large infrastructure project and the complex interaction with donors.** TANESCO was able to create new capacities in its staff, which can be attributed to the learning by doing generated with the use of the OISF. For example, PIU imposed the common weekly and monthly reporting to all contractors, where the progress of works was weighted based on the cost of each activity. This allowed engineering and procurement teams to have the same understanding of the progress of the works whenever the potential delays were discussed. As a result, the amounts invoiced were corresponding to the real progress of the works.

## **7. Comments on Issues Raised by Borrower/Implementing Agencies/Partners**

### **(a) Borrower/Implementing Agencies**

81. TANESCO appreciated the value proposition of working together with the World Bank and other development partners to develop a national infrastructure project which required strong donor coordination and stakeholder interaction. TANESCO also acknowledged and stressed the importance of having field presence of members of the energy team in the country so that problems were solved in real-time and implementation delays were more pro-actively managed.

**(b) Co-financiers**

82. The development partners acknowledged the partnership forged to harness financial resources to create a flagship infrastructure asset, that none of them could finance on their own. They acknowledged the benefits of working with the World Bank on this project, and expressed their willingness to continue working together on other projects in Tanzania.

**(c) Other partners and stakeholders**

Not applicable

## Annex 1. Project Costs and Financing

### (a) Project Cost by Component (in US\$, million equivalent)

Components	Appraisal Estimate (US\$, millions)	Actual/Latest Estimate (US\$, millions)	Percentage of Appraisal
<b>Component 1: Construction of the transmission line</b>			
Line Section Iringa-Dodoma	117.45	59.30	50.5
Line Section Dodoma-Singida	113.27	52.66	46.5
Line Section Singida-Shinyanga	117.45	66.56	56.7
Substations	31.52	31.54	100.1
Environmental and social mitigation measures	18.18	12.00	66.0
<b>Subtotal</b>	<b>397.87</b>	<b>222.06</b>	<b>55.8</b>
<b>Component 2: Technical assistance to TANESCO</b>			
Implementation support	6.00	5.70	95.0
Capacity building	4.00	0.50	12.5
<b>Subtotal</b>	<b>10.00</b>	<b>6.20</b>	<b>62.0</b>
<b>Total Baseline Cost</b>	<b>407.87</b>	<b>228.26</b>	<b>56.0</b>
Physical Contingencies	37.97		
Price Contingencies	17.12		
<b>Total Project Costs</b>	<b>462.95</b>	<b>228.26</b>	<b>49.3</b>
Front-end fee Project Preparation Fund	0.00	0.00	
Front-end fee IBRD	0.00	0.00	
<b>Total Financing Required</b>	<b>485.73</b>	<b>228.26</b>	<b>47.0</b>

### (b) Financing

Source of Funds	Type of Co-financing	Appraisal Estimate (US\$, millions)	Actual/Latest Estimate (US\$, millions)	Percentage of Appraisal
<b>Borrower</b>		18.18	12.00	66.0
AfDB	Parallel	64.86	26.33	40.6
Korea, Rep.: Economic Development Cooperation Fund	Parallel	36.06	31.54	87.5
European Commission: EIB	Parallel	134.50	66.56	49.5
IDA		150.00	65.50	43.7
Japan: JICA	Parallel	64.86	26.33	40.6

## Annex 2. Outputs by Component

		Restructuring				
		I	II	III		
Original Component	Original Cost (US\$)	Extension of Closing Date	US\$56 million Cancellation	US\$18.8 million Cancellation	Final Status	Remarks
Date		03/17/2015	02/16/2016	12/30/2016		
Component 1: Construction of transmission line	134.5	134.5	84.0	57.5	Completed	The construction of the transmission line between Iringa and Dodoma was completed with significant savings due to lower prices for commodities and other savings. The line was energized on January 1, 2017, and allowed TANESCO to stabilize its service with the added transmission capacity.
Component 2: Technical assistance to TANESCO	10.0	10.0	10.0	6.43	Completed	The two largest activities included the owner's engineer firm, which was fully contracted and utilized, and a transaction adviser firm to assist in the preparation of the feasibility study for a wind farm.
Unallocated	5.50	5.50	0.0	0.0	Eliminated	Due to the savings in Component 1, the unallocated funds were cancelled.
<b>TOTAL</b>	<b>150.0</b>	<b>150.0</b>	<b>94.0</b>	<b>63.97</b>		

### **Annex 3. Economic and Financial Analysis**

1. The economic assessment at appraisal informed the choice of final design from a comparative analysis of five technical options. The GoT, through TANESCO and supported by a team of consultants from Fichtner and Decon, decided to choose the option with the highest ERR, at 42.7 percent. TANESCO also decided to take a two-phase approach to build the project: in Phase 1 (this project), they would build the 400kV double line with both circuits strung, operated at 220kV, and, during Phase 2, a system upgrade would be carried out to operate at 400kV and to be completed by 2020.

2. The maximum power transfer was forecasted to reach 2,000 MW (1,000 MW per circuit) after the project was finished. This configuration met the technical requirements of load peak flow, short circuit, stability, losses, N-1 steady state criteria, and outage probability to meet the demand and to be able to evacuate the energy from the supply centers. The team preparing this ICR had access to the original spreadsheets of the analysis, which facilitated carrying out this evaluation at the completion of the first phase of the project.

#### **Assumptions of the Analysis**

3. The Project was designed against the backdrop of the PSMP of 2009, which had identified future load growth from mining and further urbanization in the north of the country, with most of the supply, hydroelectric dams, and gas power plants located in the south of the country. The benefits of the transmission line were measured in terms of the avoided thermal generation in the north, mostly HFO or diesel, which were substituted by the power generation from hydroelectric dams and gas-fired generation plants in the south. The substitution of HFO/diesel for renewable energy because of the transmission line would bring, consequently, a net reduction of CO<sup>2</sup> emissions. The value of the energy from an HFO plant in the north was also taken from the PSMP, with 80 percent of availability, at US\$0.1795 per kWh. The model determines the net economic benefit of the transported electricity by subtracting from the value of electricity in the north, the long-term cost of electricity in the south, which is set by the PSMP at US\$0.0645 per kWh, and its corresponding transport cost. The analysis also includes a value of US\$1.10 per kWh for the cost of energy not served, which is also taken from the PSMP.

4. Other key parameters used in the model, which are identical to the original analysis, are the following: (a) the interest rate is 10 percent, which is the standard value used in similar economic analysis within the World Bank; (b) the exchange rate of the euro to the U.S. dollar was assumed to be US\$1.4 per euro, which has changed since, but to make it comparable, this value was kept in the present analysis, and a sensitivity analysis is presented; (c) the exchange rate of the shilling to the U.S. dollar was assumed at TZS1,311 per US\$, as in the original analysis; (d) the horizon of evaluation was 30 years from the investment, considering just Phase 1, without further investments after the initial four years (2013–2016); and (e) the operation and maintenance costs were assumed to be one percent of the investment costs, which is customary for such an analysis.

## *Costs of the Project*

5. The costs of the project changed drastically from appraisal to completion. There are several explanations for these changes; however, it requires some additional insight to understand the changing prices of commodities in the market. The estimated cost at appraisal of the transmission line from Iringa to Shinyanga and its four substations was US\$468.45 million, and after the results from the international procurement processes, the final cost was US\$176.42 million, a reduction of about 62 percent.

6. The estimation of costs during appraisal were carried out at the height of the super commodity cycle of high demand generated by China's economic expansion; however, once this global demand began to slow down, prices fell drastically. The U.S. Department of Energy conducted a survey for electrical steel pricing from industrial equipment manufacturers, and it was estimated that the price of steel fell from about US\$2.25 per pound in 2008 to about US\$1.00 per pound in 2011.<sup>8</sup> The increase in prices for steel began in 2003, including grain-oriented electrical steel, and while in 2005 other types of steel moderated, those of grain-oriented electrical steel did not. It was from 2008 that the rapid price reduction began and then stabilized in 2010. The reduction in price during the period was about 55 percent.<sup>9</sup>

7. While other donors kept the savings to finance Phase 2, IDA, at the request of the GoT, cancelled unused funds and recommitted to other national priorities. The reduction in financing was an added flexibility of IDA that also allowed the reduction of the financial cost of the project.

## *Overall Results*

8. The NPV of the transmission project became an estimated US\$1.61 billion with an internal rate of return (IRR) of 42.76 percent. The same economic model prepared for appraisal was used and adjusted for this analysis, which allows to run some sensitivity analyses, as summarized in table 3.1 .

**Table 3.1. Sensitivity Analysis for the Project**

<b>Parameter</b>	<b>Base Value</b>	<b>Ranges</b>	<b>NPV in US\$, billion</b>	<b>ERR in percent</b>
Discount rate	10 percent	5–15 percent	2.4–0.5	
Exchange rate	1.45 US\$/euro	1.16–1.64 US\$/euro	1.4–0.9	48–39
Net value of energy in the north	0.099 US\$/kWh	0.066–0.132 US\$/kWh	0.61–2.61	32–65

9. The sensitivity analysis shows that the Project not only remained feasible for the country, but it also benefited from the efficiency of reduced market prices and economies of scale from one large international competitive procurement process. The result remains robust to significant variations of key parameters, just as predicted at appraisal.

<sup>8</sup> Large power transformers and the U.S. Electrical Grid, U.S. Department of Energy, <http://www.ourenergypolicy.org/wp-content/uploads/2014/04/LPTStudyUpdate-040914.pdf>.

<sup>9</sup> Energy Conservation Standard for Distribution Transformers: Notice of Proposed Rulemaking Technical Support Document, <https://www.mercatus.org/system/files/1904-AC04-DOE-Distribution-Transformers-TSD.pdf>.

## Financial Analysis of the Project's Investment Component.

10. At appraisal, it was estimated that the overall investment would be US\$475 million which was reduced to US\$222.06 million because of the price reduction during the period. The budgeted amount of US\$18.18 million for the financing of social and environmental mitigation measures was reduced to about US\$12.0 million due to the optimization of the design. The parameters of the financing were unchanged during the construction of the project, and are detailed in table 3.2, and the on lending terms to TANESCO for all of them were the same as with the GoT.

**Table 3.2. Terms and Conditions of Project Debt Facilities**

Lender	Type of Loan	Amount (US\$, millions)	Maturity (years)	Grace Period (years)	Expected Interest Rates (%)
IDA	Concessional	63.97	40	10	0.75
AfDB	Concessional	64.86	40	10	0.75
JICA	Concessional	64.86	40	10	0.01
EDCF	Tied Concessional	36.06	40	15	0.01
EIB	Non-concessional	134.50	25	Construction period	6.00

11. The parameters for the financial analysis of the project were unchanged from appraisal, and some are listed: (a) discount rate of 12 percent, (b) revenues become effective the year following implementation of investments, (c) service life of equipment and project life are 30 years, (d) The long-run marginal cost for generation is US\$0.0645 cents per kWh, and (e) the expected transport tariff of US\$0.0486 cents per kWh has been applied.

12. The revenues of the financial model are derived from the transmission revenue from the transport of energy in the different transmission line segments. The costs associated with the transmission line are the investment costs, the operation and maintenance for the transmission line and substations, and the transmission losses. The IRR is 19.9 percent and the NPV is US\$201.3 million. The IRR was about the same value as at appraisal, but the NPV is lower because of the lower investment costs. Yet, the results remain very robust at discount rate variation, from 6 percent to 16 percent, and the NPV varies from US\$695 million to US\$68 million. In sum, TANESCO managed to acquire the assets it needed at a lower cost.

## Annex 4. Bank Lending and Implementation Support/Supervision Processes

### (a) Task Team Members

Names	Title	Unit	Responsibility/ Specialty
<b>Lending</b>			
Pankaj Gupta	Practice Manager	GEEFS	Task Team Leader
Naima A Hasci	Sr Social Scientist	GSU03	
Ralph Ake Karhammar	Consultant	GEE01	
Baruany Elijah A. T. Luhanga	E T Consultant	AFTG1 - HIS	
Reinaldo Goncalves Mendonca	Consultant	GEE01	
Donald Paul Mneney	Consultant	GGO01	
Edith Ruguru Mwenda	Senior Counsel	LEGAM	Legal Counsel
Raima Oyenyeyin	Senior Program Assistant	GEE08	Team Member
Maria Alexandra Planas	Consultant	GEE01	Senior Energy Specialist
Mercy Mataro Sabai	Sr Financial Management Specialist	GGO31	Financial Management Specialist
Robert Schlotterer	Lead Infrastructure Finance Specialist	GEEFS	Financial Analyst
Luis M. Schwarz	Senior Finance Officer	WFALN	Finance Officer
Ruth T. Selegebu	Program Assistant	GCCFM	Team member
Vildan Verbeek-Demiraydin	Consultant	GEN2A	Senior Economist
Thomas E. Walton	Consultant	GEN01	Safeguards Specialist
<b>Supervision/ICR</b>			
Mirlan Aldayarov	Senior Energy Specialist	GEEE01	Task Team Leader
Gisbert Joseph Kinyero	Senior Procurement Specialist	GGO01	Procurement Specialist
Mercy Mataro	Senior Financial Management Specialist	GGO31	Financial Management Specialist
Collins S. Umunnah	Program Assistant	GEE01	Team member
Faustina Chande	Program Assistant	AFCE1	Team member
Ferhat Esen	Senior Energy Specialist	GEE01	Team member
Florentina Nyamwiza Mutafungwa	Energy Specialist	GEE01	Team member
Helen Z. Shahriari	Senior Social Scientist	GSU05	Safeguards Specialist
Lara Born	Energy Specialist	GEE01	Team member
Nataliya Kulichenko	Senior Energy Specialist	GEE07	Task Team Leader
Rahmoune Essalhi	Procurement Analyst	GGO01	Team member
Thomas Walton	Consultant	GEN01	Safeguards Specialist
Imtiaz Hizkil	Consultant	GEE03	ICR author
Dante Mossi	Senior Operations Officer	GE008	ICR author

### (b) Staff Time and Cost

Stage of Project Cycle	Staff Time and Cost (Bank Budget Only)	
	No. of Staff Weeks	US\$, thousands (including travel and consultant costs)
<b>Lending</b>		
FY08	6.7	31.92

Stage of Project Cycle	Staff Time and Cost (Bank Budget Only)	
	No. of Staff Weeks	US\$, thousands (including travel and consultant costs)
FY09	32.7	206.04
FY10	36.7	279.11
FY11	0.1	50.34
<b>Total:</b>	<b>76.2</b>	<b>567.41</b>
<b>Supervision/ICR</b>		
FY08	23.7	161.92
FY08	18.2	110.08
FY08	18.6	99.92
FY08	24.4	195.86
FY08	34.9	138.04
FY08	19.4	141.85
FY08	20.4	154.35
<b>Total:</b>	<b>159.6</b>	<b>1,002.02</b>

## **Annex 5. Beneficiary Survey Results**

Not applicable

## **Annex 6. Stakeholder Workshop Report and Results**

Not applicable

## **Annex 7. Summary of Borrower's ICR and/or Comments on Draft ICR**

Tanzania has an estimated population of about 45 million, growing annually at a rate of 2.9 percent. It has a land area of about 945,087 sq. km and is well endowed with natural resources such as hydropower, tin, iron ore, coal, gemstones, gold, natural gas, geothermal and nickel. Topography and climatic conditions allow cultivation of crops on about 54 percent of the land area. Industry has traditionally featured the processing of agricultural products and light consumer goods and more recently mining. Despite the country being endowed with a lot of indigenous resources, Tanzania is currently facing power shortage which has caused load shedding and is greatly hindering the economic performance and growth of the country.

The electricity sector is demanded to provide a vital infrastructure for the country to support its increasing economy growing and to provide reliable and affordable energy to as much as possible consumers and improving people's living standard. The Backbone Transmission Investment Project Iringa-Shinyanga is part of TANESCO's short-term strategy for National Grid Transmission Line reinforcement and one of the high priority items of TANESCO's Capital Investment Plan (CIP). The new 670 km long double circuit OHL line from Iringa to Shinyanga, designed and equipped for 400 kV level, at this first stage is operated at 220 kV with a transmission capacity of 550 MW, in order to support the critical situation in the North-Western Grid where the existing single circuit line Iringa-Dodoma-Singida-Shinyanga was operating at its thermal limits. Insufficient transmission capacity and rapid demand growth have resulted in deterioration in the quality of service due to repeated and prolonged outages and frequency fluctuations.

The reasons for having implemented the Backbone project at the level of 400 kV are:

- Strengthening of the 400 kV grids, in anticipation of future interconnections with neighboring countries of Kenya via Singida SS in the North and Zambia via Iringa SS in the South, is a key component of regional economic cooperation and development.
- The East African Power System Master Plan 2005 indicated that all regional cross-border interconnections should have been planned at voltages higher than 220 kV.
- The Ethiopia – Kenya interconnector planned to be in service in 2013, at this first phase was considering the interconnecting 400 kV line from Ethiopia (400 kV Mega Substation) with a capacity of 1000 MW to terminate in Nairobi (400 kV Isinya Substation). The planned Tanzanian interconnection to Kenya (Arusha – Nairobi), as well as the future interconnections around Lake Victoria (Uganda and further on South Sudan) require interconnections among the EAPP countries on 400 kV level, due to the planned big power plants.

After completion, the implementation of the Backbone which currently operates at 220kV level, has significantly improved the quality of grid power supply in the central and northern parts of the country including the regions of Dodoma, Singida, Arusha, Shinyanga and Mwanza. The achievements of the Backbone after commissioned include:- (a) Reduction of grid load shedding following improvement of power transmission capability (b) Reduction of unplanned power outages, dips and swells (c) Minimizes the usage of diesel generators used to support system voltage (d) Improvement of data recording using the TANESCO Supervisory Control and Data Acquisition system (SCADA) (e) Minimizes the outages during maintenance following adoption

of double bus bar system at Dodoma, Singida and Shinyanga Substations, (f) Consumption of power supply increased to the large consumers including mines in Shinyanga after commissioned the Backbone project.

The following are lessons learned and experienced during the implementation of the Backbone project.

- For a multi Lenders projects, we recommend the Lenders to nominate and have one lender steering all issues related with procurement including the applicable procurement guidelines and responsibility for all approvals under procurement on behalf of others instead of seeking approvals of same item from all Lenders separately as this leads to serious delays.
- To avoid delays on acquisition of land (Right of Way-ROW) for the coming projects, we do recommend there be some flexibility from the Lenders to include in the loan amount the cost of compensation. This will allow clear access to sites before onset of project implementation.

## **Annex 8. Comments of Co-financiers and Other Partners/Stakeholders**

EDCF prepared a Project Completion Report<sup>10</sup> in which the main conclusion is that “The purpose of the project was to reinforce the national transmission line by constructing a new transmission line of 670 km from Iringa to Shinyanga and the extension of four existing 220 kV substations in the towns of Iringa, Dodoma, Shinyanga and Singida. This project helped to link the existing and future generating sources in the south and southwest of Tanzania to the load centers in the Mwanza and Arusha regions in the North. This energy expansion project has improved the quality and efficiency of the electricity service in northwestern regions of Tanzania, established a sustainable transmission line for energy access expansion to meet growing energy demand. The project contributes to the economic growth and poverty reduction through reliable supply of electricity and increase of the customer database.”

JICA indicated that while institutional strengthening of TANESCO was visible in terms of the technical knowledge, and management of social and environmental safeguards, there is still room for staff to improve with their know-how for the future negotiations for the new IPP contracts being negotiated.

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<sup>10</sup> Project Completion Report for the Design, supply and installation for Upgrading Four (4) 220kV Substations (in the Towns of Iringa, Dodoma, Singida and Shinyanga) implemented under Iringa-Shiyanga Backbone Transmission Investment Project (BTIP) Substations-Lot4, EDCF Loan Agreement No.: TZA 06, May 2017

## **Annex 9. List of Supporting Documents**

- Backbone Project Completion Report, December 2016, FICHTNER
- Large Power Transformers and the U.S. Electric Grid, United States Department of Energy, June 2012
- Mid Term Review Report for the Backbone Transmission Investment Project, September 9-24, 2014
- Restructuring Paper for the Backbone Transmission Investment Project, March 17, 2015, The World Bank
- Restructuring Paper for the Backbone Transmission Investment Project, February 16, 2016, The World Bank
- Restructuring Paper for the Backbone Transmission Investment Project, December 30, 2016, The World Bank
- Project Completion Report of “Design, supply and installation for Upgrading Four (4) 220kV Substations (in the Towns of Iringa, Dodoma, Singida and Shinyanga) implemented under Iringa-Shinyanga Backbone Transmission Investment Project (BTIP) Substations-Lot4, EDCF Loan Agreement No.: TZA 06, May 2017

